SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1239.—Vol. XXIX.] LONDON, SATURDAY, MAY 21, 1859. [WITH JOURNAL] STAMPED.... SIXPENCE. UNSTAMPED. FIVEPENCE.

The Mines and Minerals of America.

No. III.

COAL AND CANNEL MINES OF KANAWHA, VIRGINIA.

In the Coal River district are four extensive mining properties, on which a large amount of capital has been expended; up to the close of last year neither had returned any dividend profit; this has, however, not arisen from deficiency in quantity or quality of the coal, but chiefly from want of a cheap and ready means of transportation. A great amount of energy has been displayed by one of the companies, and the mines put in a fair working order; but an unfortunate accident occurred, in December, 1857, that suspended the operations of all the mines during last year. An unusual heavy flood quite inundated the country, and in its violence swept away, or seriously damaged, all the locks and dams on the river; these, however, have recently been reinstated at a loss of $40,000, and the navigation is again in working order throughout. Two of these mines have resumed working, and a great deal of activity prevails. Cannel is being shipped off as fast as the companies can obtain boats to take it away; preparations are also being made for the recommencement of the others. The chief mines are at Manningsville, Briarport, and Peytona, at which latter place there are two now in profitable operation. There are several very valuable setts along this river; one, in particular, called the "Lick-Creek Cannel Mine." This property will some day, if it should fall into the hands of a practical working company, become of immense value. I made an examination of the cannel seam a few weeks since, and must say it is equal to any I have seen in the district for quality. The seam is 5 ft. thick, and yields 3 ft. 3 in. of pure cannel, with a streak of fine bird's-eye running through the centre: this is equal to 5000 tons to the acre, and which, at a royalty of 20 cents per ton, brings the assessible value up to $1000 per acre. Below this seam are the usual bituminous splint coals, giving 16,000 tons to the acre, which I consider worth, at a royalty valuation, 5 cents per ton, or equivalent to $800 per acre, making collectively for the whole mineral $1800 per acre. The estate is now in the market for sale in one lot, at quite a nominal price. There are about 3000 acres in all, two-thirds of which are underlaid by coal above water-level. It lies admirably for working economically, being on the river. This would be a good investment for some capitalist, for it might be let out in lots of from 100 to 500 acres; there are plenty of persons who would willingly rent a mine, and pay 25 cents per ton for the cannel.

The Briarport Mines are situate on the right bank of the river, 24 miles from the confluence with the Kanawha. The estate comprises 4000 acres of forest land, nearly the whole of which is underlaid by some of the richest bituminous coal of the splint variety that can be found in the United States. There is only one seam at present discovered that contains any workable quantity of cannel: this is 3 ft. 6 in. thick, and yields 2 ft. 3 in. of fine cannel. It has 10 in. of soft friable bituminous coal on the floor, and 5 in. of bastard cannel under the roof; this 10 in. of soft coal under the cannel allows for an excellent bearing in, and admits of the seam being very cheaply wrought. If the company would take my advice, and adopt the "long-wall system" in the working of these narrow seams, the coal may be mined and put on board the barges in the river for 95 cents per ton, and the cost for transportation need not exceed $1 more; say, including river tolls, and expenses delivered in market, that its cost to the company is $2·15, it leaves a good margin for profit; for every ton they can mine would readily sell for $4·50 to gas companies. It is a beautiful velvet-tint black coal, works out in large rhomboidal blocks the whole thickness of the seam. It is quite solid, has no waste, free from sulphur, and will bear any amount of tumbling about in transportation. It burns with a white flame, and leaves a residue of white ash in the form of a fine powder, which makes an excellent article for polishing brass and cutlery, it being free from grit; it makes no cinder, and does not clinker. I cannot advocate its use as a parlour fuel, as the ash makes the grate always look dirty; it looks very beautiful burning, as it is nearly all consumed in flame; a fire made of this coal on a cold dark winter's night is indeed a cheerful sight. The average specific gravity may be taken at 1·256; therefore it gives 1620 lbs. to the square or superficial yard of seam, and 3500 tons to the acre. By an experimental analysis on a large scale, its yield was found to be 60 gallons of crude oil to the ton, producing when rectified 40 gallons of refined oil, and in the following proportions:—

Burning oil	24 gallons,	valued at	85 c. =	$20·40
Lubricating oil	13 „	„	80 c. =	10·40
Benzole, very pure	4 „	„	1·00 c =	4·00
Paraffine	2 lbs. (min. tallow)		25 c. =	·50
Chemical value				$35·30

The manufacture of these hydro-carbons is now assuming a prominent feature in this country. There are three works now in profitable operation, and seven more are about being erected; three of these are on this river, two on the Kanawha, and two on the River Elk. Cannel coal oil-making is one of the most profitable branches of mining in Kanawha, the demand for burning oil rapidly increasing all over the country. Most of the companies that are at work are deficient of working capital, consequently the supply for some time to come will be limited, and totally inadequate to meet the demand. Prof. Dumas, a practical chemist, who has had great experience in coal oil-works, both in Scotland as well as in this country, informs me that a well-conducted works, consisting of 40 retorts, and using Briarport coal, will realise a nett profit of 60 per cent. per annum on the capital expended in the erection of the works after they are once put into full operation. This estimate, however, is based upon the calculation that the cannel coal is to be delivered on the works at a cost not exceeding $2·50 per ton, which is to be done by the present mining company. The works and working capital are to cost about $30,000.

The bituminous seams above water level are four in number; their aggregate working thickness is 12 ft., giving about 18,660 tons to the acre. They are all splint coals of the very finest quality, and are quickly bought up when offered for sale on the Ohio River; they sell at from $2·50 to $3·25 per ton, according to the state of the coal market. The mining, hauling, and loading cost is 90 cents per ton. The greatest impediment to their being profitably wrought is the absence of steam-power on the river for towing the coal boats down. The coal as shipped hitherto has been taken by rude flat boats, which are rowed or polled down the river; and as the cost is too heavy to admit their being brought back in the same manner, they have to be sold on the Ohio, where they realise quite a nominal sum. Now, this loss on the boats, together with the slow, dangerous, and expensive mode of transportation, so enhances the cost price of the coal, that scarcely any profit accrues to the colliery owners. Now, if efficient steam-tugs were put on the river, and these only cost $6000 each, and proper barges were provided for the coal, the freights from here to Cincinnati would not exceed from 60c. to 80c. per ton, thus leaving nearly 80c. per ton profit.

The Briarport Company are making arrangements for raising additional capital. They should not have less than $100,000; with this they could ship 10,000 tons of coal and cannel per month, and thus realise a very handsome revenue. They have the best located property on the river, and they know it, for they hold the mineral portion of their lands in such esteem that an offer of $500 per acre for a small track has been peremptorally refused. The village consists of about twenty cottages, scattered about, a school, saw and grist mill, and store. A new town has recently been plotted out in regular streets, on an eligible site overlooking the river, and this next summer, it is said, active mining operations will commence. Capital could very profitably be invested at this place in several ways, especially on the river in the transportation business, but more certain and profitably in the oil-works. The present company are highly respectable, being principally composed of merchants in New York of wealth and standing; they have, like many other companies, been unfortunate in the selection of their managing agents, the result of which is that a large amount of money has been expended, with very little to show for it: they are now, however, in a better position, and what capital in future that is raised will be judiciously laid out.

A mineral railway from this place to the Kanawha River has been projected, to be called the "Briarport and Kanawha Mineral Railway;" it is 12 miles in length, and will run through the heart of this coal field. The average grade is not over 50 feet to the mile, there is only one tunnel, of about 400 yards long, and this will be driven through in a seam of coal all the way. The line will enter the Kanawha River at Davis Creek, about five miles below Charlestown, thus avoiding the most prominent shoals on the river. The preliminary estimated cost is $80,000, it can be completed in 15 months from date of commencement; the road will open with a heavy freight traffic of 500 tons a-day, and increase rapidly, for many of the mines along the line, and others that lie up the valleys that intersect the valley of the railway will go into working. Then there is the Hunley Iron Mines and the limestone quarries, and hundreds of acres of primitive forests to be cut; these will go to work, and the produce must be run over the line. Then, again, there is the immense property adjoining Briarport—the Manningsville Mines; a line of two miles will make a connection from there. Again, the Peytona Mines, when the owners find the Briarport Company can send their coal away as fast as it is mined, at any season of the year, will very soon construct a line down the river, thus making this place the terminus of several lines of roads. I consider this one of the most promising speculations of its kind I have met with in Virginia, and feel quite certain it may be made to pay 10 per cent. on stock. It would be a good investment for some of our London capitalists, and far preferable to the bulk of our American railroad bonds, whose daily fluctuation of price renders them anything but a safe investment. I shall continue this article in a week or two, and embrace in my next the Peytona Mines.

C. S. Richardson.

Southampton, Massachusetts, and Charlestown, Virginia.

Glances at Recent Geological Literature.

No. III.

"Siluria. *The History of the Oldest Fossiliferous Rocks and their Foundations: with a brief sketch of the Distribution of Gold over the Earth.* By Sir Roderick I. Murchison. Third edition (including the Silurian System)." 1859.

This goodly volume contains 592 pages of letter-press, and numerous plates and illustrations; even as to bulk, therefore, it is of no slight consideration, while as to intrinsic value it may be regarded as the most important geological publication of the season, and indeed of many seasons. True, it is merely a new edition, but this edition is so greatly improved that it might almost be considered as a new work in comparison with the first edition; while in comparison with the second this is not indeed a new work, but a marked advance, with such modifications and additions as the increased knowledge of the subject treated demands.

It must be obvious that to present any adequate notion of the contents of this bulky volume we must devote some space to its consideration, and require careful attention on the part of our readers, since we cannot stay to offer detailed explanations of terms or discoveries, or particular strata or organic remains. It must be premised that the book is very far from popular in style, or generally attractive in its treatment of its subjects. It is the work of a geologist who is more careful about his matter than his style, and the correct statement of his mature views than the investiture of them in the showy drapery of highly-wrought language. In this respect it is as different from the *Sketch-book of Popular Geology*, by Hugh Miller, which we recently analysed, as one book can well be from another on a similar subject. We have not met with a poetical page in the whole volume, nor a single attempt at imaginative description; if such there be in any part of the book, it has escaped our observation. Nor should it be concealed that this is not a book for mere beginners in the science. It is thickly studded with hard names, of which there is no explanation, nor is any glossary appended to the volume. Many, too, of the names of fossils will be new to geologists of older schools, and we confess that had we not been ourselves practically versed in the Silurian formations, and acquainted with their fossils *in situ*, and in museums, we should have been disposed to lay aside the volume as too uniformly technical. We think it right to premise thus much, because if any one should purchase this volume for light reading and entertainment he would be egregiously disappointed.

A decided desideratum, therefore, is a small popular volume, which should be introductory to this large one, and which should contain elementary statements on all the formations, and especially the principal fossils—not as a book of general geology, but of Silurian geology in particular; and we think that Sir Roderick could not more usefully and nobly employ his ample resources than in preparing such an elementary volume, which would be gratefully received by that most numerous class of readers who have little time, little preliminary knowledge, and limited purses. It is hardly to be expected that a couple of guineas should be easily expended by the large mass of would-be geologists; nor could we venture to say that, even if expended, a satisfactory purchase would have been made by the class of purchasers to which we are now alluding. In default of this little book for the present, we may attempt to supply such a brief analysis of the volume before us as may at least qualify the reader to judge of the value of the work to him. Of its value as a scientific book and a geologist's work of reference there can be no doubt.

"What is meant by Siluria" will be the first enquiry, and we shall endeavour to answer it. The name is topographical, or rather ethnological, and so far has no relation to geology. An ancient British people, the *Silures*, had under their King Caradoc (the Caractacus of classical authors) opposed a long and valorous resistance to the Romans. This people dwelt in a part of Wales where the formations treated of in this book predominate, or rather compose the country. One word being in demand as a title, none more locally descriptive could have been selected. Formerly the title chosen was the "Silurian System;" now one word is thought sufficiently significant. Thus an ethnological* term has become a geological one, and "Silurian fossils" are continually spoken of; though, in fact, this is a mixed phraseology, which is not purely scientific; yet it would have been difficult to find a much better term in brief, and now, at all events, it is established in geological nomenclature.

The origin and course of the complete work may be thus traced from its first conception. About the year 1830 Sir R. I. Murchison was paying attention to the strata now named Silurian. At that time no one had unravelled the detailed sequence and characteristic fossils of any strata of a higher antiquity than the old red sandstone, and even that formation was only known to be the natural base of the carboniferous or mountain limestone, and to contain a few fossil fish. Not only were the relations and contents of all the inferior strata undefined, but even many rocks which are now known to be younger than the Silurian were then considered to be of the most remote antiquity. No one had then surmised that certain hard slates, with fossiliferous sandstones and limestones, which have since been termed Devonian, were equivalents of the Old Red Sandstone, and younger than, as well as distinct from, the deposits of the still older Silurian era.

In 1831, the author first explored the banks of the Wye, between Hay and Builth, and discovered a considerable tract in Hereford, Radnor, and Shropshire, wherein large masses of grey-coloured strata rise out from beneath the old red sandstone, and contain fossils differing from any which were known in the superior deposits. After four years of labour in classifying and exhibiting fossil evidences, in which he was much assisted by the late Rev. T. Lewis, of Aymestry (who ought to share the author's honours), he assigned, in 1835, the name of Silurian to the whole series of strata, thus claiming for them an independent name and place in the geological series of formations. He subdivided the groups into Upper and Lower Silurian, and, in 1838-9, published that magnificent but superseded work, "The Silurian System," in quarto. Continuing to attach topographical names to the subdivisions of the series, he called these, in the descending order, the "Ludlow," "Wenlock," "Caradoc," and "Llandeilo," formations. What is thus presented as a well-ordered succession of rocks was formerly regarded as one assemblage without definite sequence, and was included under the name of "grauwacke," an old German compound, and "transition limestone."

The general order of the primeval rocks is as follows—gneiss and ancient slates form the foundation; then succeed the Cambrian rocks of the British Geological Survey, containing only the faintest indications of organized life. Vast traces of gneissic rocks and ancient slates are found in other countries, and in both Europe and America these primary crystalline rocks abound; but in no part of England and Wales have any rocks proved to be of more remote age than the basement strata of the whole Silurian region, named Cambrian, from their prevalence in Wales. In the rocks that flank Loch Assynt, in Sutherland, of which a coloured view forms the frontispiece to this volume, we see old gneiss, and immediately upon it a mountain of Cambrian sandstone; below this, in geological order, are found in the same place lower quartz rocks, limestone, and upper quartz rock. As English or Welsh geologists, however, our first formation is the Longmynd rocks, so called from Longmynd, in Shropshire, where they are seen as round-backed hills suddenly flanking the western side of the road from Ludlow to Shrewsbury, and rising to heights varying from 1400 to 1600 feet above the sea. Ranging from north-north-east to south-south-west, they stand boldly out from beneath the surrounding Silurian deposits, of which they form the mineral axis. Their lowest strata are thin, fragile, glossy schists, or clay-slate, with two or three minute layers of silicious sandstone, each scarcely exceeding an inch in thickness. On the whole, the Longmynd rocks consist simply of sandstone rock, both schistose and gritty, and often finely laminated, in which the lines of deposit, and even the rippled surfaces of the beds, are distinctly visible. The thickness of these rocks in Shropshire has been estimated by the Government surveyors at not less than 26,000 feet, as exposed in their highly inclined edges, the beds dipping at the average inclination of about 60° to the west-north-west.

Up to 1854, no traces of organic remains had been discovered in any of these Longmynd rocks, and hence they have always been spoken of as unfossiliferous. Lately, however, faint traces of animal life have been discovered by the most persevering researches in these ancient sediments; so faint are the traces, that we doubt if one of a hundred spectators would admit them to be such; we have inspected them more than once, and only accept their designation in deference to authority. They are of two kinds—1. Surface-holes, made by annelides (creatures of the class of worms with red blood), and specifically by a sand-worm; also sinuous tracks or trails of such animals.—2. A fossil supposed to be a caudal part of a trilobite, named *Palæopyge Ramsayi*, which hard name literally means, we suppose, "an ancient tail-piece of Ramsay"—not that it refers to the presumed tail of that worthy geologist, Professar Ramsay, but that the tail is named in his honour, and that he (happy fate!) will ride down to posterity upon the tail of a trilobite! Such luck does not befall every scientific man; it is only the reward of a long series of labours in the good cause! Further researches have brought to light no other remains of crustaceans, though additional tracks or impressions of annelides have been discovered. Let every one, therefore, endeavour to inspect, and learn to venerate this tail of a trilobite, seeing it is at present the earliest specimen of animal life, except a few contemporaneous worms, in existence—at least as known to man.

It is remarkable that in North Wales where the same Cambrian, or Longmynd rocks occur, no fossils, except marine plants or fucoids, have been detected in them, and these of obscure kinds. In Ireland, however, they contain two species of a peculiar zoophyte, which has been detected by Professor Oldham in the purplish hard schists of Bray Head (county Wicklow), and has received the appropriate name of Oldhamia. This is a polype, or perhaps a coralline, of which two species have been collected. Specimens are shown with it well preserved, and it reminds the naturalist of the living Sertularia. These, then, are the oldest fossil signs of life with which we are at present acquainted, after the most assiduous researches in the basement deposits of such vast dimensions. It might thought that these rocks are much altered, and thus the traces of animal life obliterated, but this is not the case, for "they are less altered than much younger rocks replete with organic remains." Here, then, we have arrived apparently at the cradle of organic existence, and forbidding and

* Geological nomenclature is often dependent upon topography, as in the name Devonian.

gloomy as this immense mass of Longmynd rocks otherwise is, it cannot be so when we find here the infantile types of the vast and countless races of creatures who have succeeded them, and who have once flourished and died, and become entombed in strata thousands of years afterwards. The fossils alluded to are nothing in themselves, but most venerable, and most important in their position and priority of existence. Incomparably more ancient than the oldest monuments of man, and the earliest primeval traces of his existence, they are now brought under man's view and consideration, and teach him that in times to which he can hardly assign any measured chronology, there was still life—life in its beginning—life in forms which he can recognise as having once had animate existence.

If we should merely regard the Silurian rocks as to the amount and beauty of their organic remains, then we should pronounce them to be far inferior to the lias, the oolite, the chalk, and many other later formations. But it is in relation to time and precedence that we must regard them, and then they have peculiar interest. Much as the specimens of ancient art in any museum of antiquities may, intrinsically considered, be viewed as inferior and worthless, so would Silurian organisms of the earliest rocks appear; but as in the museum of art, so in that of organic remains—the age and the specific significance of the specimens includes their interest, and expresses their importance. The oldest inscription ever cut in stone, or carved in other material, would excite intense attention, though its letters might be rude and almost undecipherable. So the oldest forms of life should claim our most careful examination and our full appreciation. In this spirit we shall continue our analysis and popular exhibition of the chief contents of the present important volume, believing that we shall be doing a great service both to that large class who will not see the volume itself, and even to that smaller class who, though they may see it, will want eyes to see its value; or, in plain terms, will find a popular introduction to it of especial service, in rendering it more intelligible and less forbidding than a mass of nearly 600 pages of print would otherwise be.

COAL-BURNING LOCOMOTIVES.

On Wednesday evening, Mr. BENJAMIN FOTHERGILL read before the Society of Arts an elaborate and highly important paper "On the relative Value of Coke and Coal in Locomotive Engines," the object of the paper being to corroborate assertions which he had made on a previous occasion —1. That coal was decidedly superior to coke in respect to heating power, and, consequently, more economical.—2. That a plentiful supply of steam could be generated by the use of coal for working engines at high velocities, and for drawing heavy trains.—3. The capabilities of coal-burning engines for consuming their own smoke.—4. The increased durability of fire-boxes and tubes when coal was used.

In addition to his contrivance for admitting of the substitution of coal for coke, Mr. Joseph Beattie, the locomotive superintendent of the London and South-Western Railway (whose inventions were used by Mr. Fothergill in his experiments), has another of considerable importance for using a portion of the exhaust steam for heating the feed water before it enters the boiler. The water is received on a perforated plate in the tank under the foot-plate of the engine, and in its descent comes in contact with and condenses the steam, and thereby becomes heated. In the course of his first series of experiments, Mr. Fothergill used the feed water supplied by Mr. Beattie's apparatus at a temperature of 196° Fahr.; and as he was anxious to obtain an analysis of the fuel used by the London and South-Western Railway Company, and the more so as he found that they manufactured their own coke from "Ramsay's coking coal" (Newcastle), which is of a superior quality, and as it was desirable to ascertain, as far as possible, whether the coke or the coals which were supplied to him contained the greatest amount of sulphur, he sent samples of each to Mr. Dugald Campbell, analytical chemist to the Brompton Hospital, London, who, after a careful examination, gave a report, of which the subjoined is a summary:—

	No. 1.	No. 2.	No. 3.	No. 4.
Density	1·279	1·055	1·333	1·341
Carbon	85·57	86·91	89·16	66·21
Hydrogen	5·68	1·32	4·06	4·09
Oxygen	3·07	0·10	1·65	11·07
Nitrogen	1·48	0·80	1·21	1·13
Sulphur	1·46	1·94	1·39	1·01
Moisture	0·74	1·28	0·67	9·23
Ash	2·00	7·65	1·86	7·26
Total	100·00	100·00	100·00	100·00
Pounds of water which 1 lb. of fuel would evaporate from 212° Fahr.	15·18	12·78	14·74	9·08
Pounds of lead reduced by 1 lb. of fuel	34·99	31·35	34·74	25·14

No. 1. Ramsay's coking coal.—2. Coke from Ramsay's coking coal.—3. Llanguathog Merthyr coal.—4. Griff coal.

The experimental trips were commenced by Mr. Fothergill with the coal engine "Ironsides" (he having personally inspected the weighing of the fuel in the morning, and again at Southampton, and on the return of the engine to Nine Elms taken an account of the coal which remained on the tender, had the fire-box cleared out, the hot material cooled and riddled, the worthless portion separated, and allowed the value in good coal for the remainder), which had been constructed on Mr. Beattie's patented plans, for burning coal only, and heating the feed-water; he took the 10·15 A.M. mail train from Waterloo Station to Southampton, and arrived there at 1·5 P.M. They commenced the return journey at 3·0 P.M., and arrived at the Waterloo Station at 5·58, the engine having performed the trip in the most satisfactory manner, and without any appearance of smoke, except when the steam had to be got up in the morning, or the fires prepared for the return journey.

The day's trip showed the average consumption of fuel as 16·71 lbs. of coals per mile, or when reduced to its coke value equal to 11·14 lbs. per mile, with an average load of 12·2 carriages per mile, travelling at an average speed of 31·25 miles per hour.

In stating that the consumption of coal, when reduced to its coke value, was equal to 11·14 lbs. per mile, he means that since experience has proved that, in order to make 1 ton of good coke suitable for locomotive engines, 1¼ ton of the best coking coal is required, and with some kinds of coking coal, 1½ to 1¾ tons are necessary to produce 1 ton of coke, it will be evident that if the same load can be taken, at the same velocity and under the same circumstances in respect to weather, with equal weights of fuel, say with coal in engines fitted up with Mr. Beattie's patented contrivance, and with coke in the ordinary class of engines, a nett saving is effected of one-third, or 33 per cent., in fuel alone, without taking into consideration the incidental saving consequent on the construction of coke ovens, the interest on capital, the cost of their maintenance, and the wages of workmen employed in the manufacture of coke.

He worked the coal engine "Ironsides" for three days with little variation in respect to the quantity of fuel consumed, that little variation arising from the change in the weather. He then selected the coke-burning engine "Vesuvius," one of the ordinary class, and being nearest in dimensions and weight to the "Ironsides," and in good working order, and with it took a similar train (10·15) to and from Southampton, burning coke only, and adopted the same course of proceeding as on former trips, but with a very different result as regards the consumption of fuel; for the average load was 12·1 carriages, the average speed 30·27 miles per hour, while the average consumption of fuel was 20·62 lbs. of coke per mile. On the following day he took the "express" train with the same engine, but the results were substantially the same as on the previous day with the "mail" train.

Having tried the "Vesuvius," he decided upon taking another coke-burning engine, the "Frome," which was a similar class engine to the "Vesuvius," in order to ascertain if there was any difference in the results of their working, and the consumption of fuel was remarkably near that of the "Vesuvius." He then determined to test the capabilities of another coal-burning engine, the "Canute," and compare the results of its working the "express" train with that of the "Vesuvius." The load was lighter, averaging 9·3 carriages, but the average speed attained was higher, being 36·76 miles per hour. The consumption of fuel was 16·71 lbs. of coal per mile, the coke value of which is 11·14 lbs., against 20·62 lbs. per mile consumed by the "Vesuvius." The experiments up to this period showed a decided advantage in coal-burning engines, so far as regarded economy of fuel, &c., but the result was not conclusive to his mind, inasmuch as the engines had not worked under precisely the same circumstances with respect to weather and uniformity of load and speed. He, therefore, obtained a sufficient number of carriages to form two trains of equal size and weight, and had a quantity of materials weighed and placed in each of them equivalent to a load of passengers. The coal-burning engine "Canute" was attached to one of the trains, and the coke-burning engine "Vesuvius" to the other. The weight of the train, including engine and tender, drawn by "Canute," was 170 tons 8 cwts., and that drawn by "Vesuvius," 167 tons 12 cwts. The trains left London and Southampton within a few minutes of each other, so that there could be no difference between them in respect to weather; but lest either train should run heavier than the other from extra friction in the axle bearings, he took a second trip on the following day with the engines changed from one train to the other. He registered the particulars of each day's trip separately; but taking the average of the two days' working, the difference in respect to consumption of fuel will be the more readily seen:—

	Average speed.	Average consumption of fuel in lbs. per mile.	Load.
"Canute"	28·40	Coal 20·36	19 carriages.
"Vesuvius"	27·23	Coke 24·37	19 "

Coal reduced to its coke value 13·57, which shows a clear saving of 10·80 lbs. per mile.

Further experiments of a similar character gave nearly similar and equally satisfactory results. With respect to the durability of the tubes and fire-boxes, when coal is used instead of coke, he considers that question to be settled beyond dispute in favour of the former, inasmuch as it no longer remains a matter of opinion merely, but the result of continuous working with coal and coke demonstrates beyond all doubt that not only is coal superior to coke in respect to heating power, and, consequently, more economical, but it is less injurious to both the tubes and fire-boxes of locomotive engines. In conclusion, he remarks that previous to 1853 several attempts had been made by different individuals to introduce coal as a substitute for coke in locomotive engines, but from various causes they did not persevere in developing its true commercial value, and he would take this opportunity of stating that the credit of this important saving in railway expenditure is due to the skill and persevering industry of Mr. J. Beattie.

THE WAR, AND THE METAL TRADES.

[FROM A CORRESPONDENT.]

The mineral interests of this country are at this moment, if political circumstances do not alter, on the eve of a great depression; not solely from the imminent general war in Europe, but from the financial difficulties of the Indian Government; thus large markets which have directly acted on our iron and steel manufactures, and indirectly on our copper, zinc, and tin manufactures, are greatly affected.

In these considerations, railways, steam navigation, and shipping are especially to be borne in mind. In the late rapid progress of Europe it was evident that the demand for railways must go on until something like the present standard of England was reached; and although much of the required material would be supplied from local manufactures, yet a very large proportion was sure to be derived from this country. The progress of Central Europe likewise influenced its outlying members. In Spain, Portugal, Italy, Poland, Russia, the Danubian Provinces, Turkey, and Egypt, a vast field of extension was created, and the demand seemed almost illimitable; but already most of those countries are involved by the disturbance of the present war, and the rest are threatened. Spain and Portugal escape for the time, but Italy is involved; and Eastern Austria, the Danube, Turkey, and Egypt, are menaced by political ferment.

In Italy a heavy blow has been struck at railway operations. Those who believed in peace principles were prepared to expect that a railway was a kind of sacred path, wherefrom a few rails might be put aside to impede transit, but which was otherwise unassailable; so that when the rage of war was stilled, railway bridges, viaducts, stations, and plant, would be found untouched, ready for the profitable labours of peace. This belief has been very rudely checked; the Sardinian railways to which we contributed have in the war district been thoroughly cut up, and the plant confiscated as munitions of war. The shareholders of the Lombardo-Venetian and the Tuscan railways already tremble, and with reason; nor are their shares saleable except at a very great depreciation. Those railways that escape for the time, or are not yet attacked, are impressed for purposes of war, and all profitable commerce stopped. Thus a great discouragement is inflicted on foreign railway enterprise in this country, and the loss is very great.

Some may think that we have enough to do at home, that we have no business to invest money abroad, and that the loss serves us right; but the operations have constituted a great source of wealth to us. By Englishmen taking in the whole or in part the initiative in railway undertakings, English engineers and contractors have been employed, large quantities of rails and engines have been supplied, and in the end the shares taken have been sold to the natives at a profit, when the undertaking has been brought into working order. Our positive investments were comparatively limited, but our profits were considerable, as in the long run we only lent the capital, and obtained native capital for the construction. Thus the stoppage of this class of operations is of serious detriment to our own mineral and other interests; and the loss becomes the more considerable, because an element of great uncertainty being introduced, and in some cases of positive risk, our capitalists are indisposed to engage in such undertakings.

To some extent this unfavourable effect may be compensated by a rise in the rate of guaranteed interest by those Governments desirous of pushing on their works, as Spain, Portugal, and Turkey, and as the local rates of interest will rise, so must the general rate of guarantee be raised, but this will only afford a partial remedy for a general stagnation of operations.

The supply of iron and timber, paddle and screw steamers, and of iron shipping, was another beneficial branch of business largely consuming iron, steel, copper, brass, tin, and coals, and this is doomed, for a system of blockade has already began; and as to the supposed newly-acquired rights of neutrals, they will be found to protect our operations but little. The coasting trade of Italy has received a heavy blow, and our steamers going into Trieste with Indian mails and passengers have been boarded by French boats, and have got notice that the Trieste route is closed to us, and that we must keep to Marseilles so long as we are allowed to use that. At present the amount of mischief done is small, but the stoppage of operations is effective; the English capitalist is more cautious, and the foreigner is put at a disadvantage. In these times no English capitalist, contractor, or manufacturer snaps at a foreign order, but if he is a prudent man requires a credit in London; but then this very prudence narrows the scope of trade, because it narrows credit.

We have dwelt upon these large classes of business, because the operation can be followed out by anyone, but trade generally is no less affected in all its minute ramifications. Anything in the nature not merely of speculation, but of provision for the future, is stayed throughout Central Europe. A large part of the population remember that their districts are the hereditary and appointed battle fields of Europe, the lists in which the greater champions meet. Take the map of Europe, and a broad belt marks Belgium and French Flanders, the Grand Duchy of the Rhine, Nassau, Hesse, the Palatinate, Baden, Wurtemberg, Bavaria, the Swiss frontier, Lombardy, and Piedmont as a doomed region, in which it is unsafe and unwise to put up even a new barn. In these countries, and those adjoining them, the war taxes have at once affected consumption, for their social and politico-economical condition is different from ours, inasmuch as the population have no positive right to maintenance from the fruits of the soil; thus there is no safeguard against absolute misery and depression for large classes of the population.

All this is serious for us, but what is still more so is the state of affairs in India. The Indian Government, caught in the difficulties of a period of transition, is labouring under financial embarrassment, without a settled policy, and without firmness of mind on the part of its administrators to maintain its proper course. The railways have been made to depend upon guarantees, and the Indian Government believes that it makes great sacrifices in conceding a rate of 5 per cent., but at the present moment securities will not float on such terms. All the Indian stocks and shares, paid-up or with calls on them, are now at a discount, and the operations of the existing companies will proceed less rapidly. It is, of course, quite impossible for any new lines to be carried on with a 5 per cent. guarantee, and, therefore, the extension of Indian railways is for the time brought to a dead lock. This causes no discomfiture to the Government, for the Government has no honest intentions of carrying on railways or public works in India at present. Practically, the whole of the railways of those vast countries, containing 180,000,000 of people, are turned over to two or three subordinates of the Government, under the title of official railway directors, who have neither power nor disposition to extend the railway system, and whose functions endow them with a large obstructive power. The public are by no means aware that the board of a great Indian railway company, with 8,000,000*l.* or 10,000,000*l.* of capital, has practically no power, as the proceedings depend on the fiat of the official railway director. In the Presidencies a system prevails equally effective for obstruction, and thus, to the great satisfaction of the Indian authorities, the progress of public works is stayed. They had got frightened at the late slow progress, which was to them a terrific speed, and now they hope they cannot be tormented for branches and extensions, but can wait quietly to see whether the whole of the East Indian or Great Indian Peninsula Railway will pay 7 or 8 per cent., as well as the large section now open; and while they wait for the result of the experiment, the only efficient means for the improvement or restoration of the country are withheld.

This state of affairs is a matter of great importance to this country. Through the mismanagement of the Government private enterprise has not free and full scope, as may be well enough seen in the case of railways. Thus for some time it will be greatly dependent on the action of the Government, and unless the Government intervene in a judicious spirit enterprise must languish. It is agreed by the best authorities that the development of India depends upon the promotion of public works; but then the Government of India must be compelled to promote public works by the voice of public opinion here. If the Government is not honest in its course it must be compelled to take the right steps, and if 5 per cent. will not secure the construction of public works 6 per cent. must be given. At one time the Government of India would allow only 4½ per cent., but on the works being brought to a standstill, as now, was forced to raised the rate to its present standard of 5 per cent., and now if 5 per cent. will not do 6 per cent. must be given.

Railways and steam-boats are the lungs of all other enterprise in India, and now that this country is pressed by the consequences of a European war, it is of primary importance that the resources of India and our colonies shall be made available to our commerce.

ALUMINIUM-BRONZE.

When, a few years since, M. St. Claire Deville discovered a new process for obtaining aluminium in bulk, and with economy, great expectations were raised that the pure metal would come largely into use. It was for a time thought that aluminium might displace silver for the manufacture of articles of luxury; that it would be adopted as a material for coinage, as a substitute for tin amalgam and silver foil in the production of mirrors, as a material for the arms of balances, &c.

These ideas have not been fully realised. Pure aluminium hitherto has been found capable of application to very few industrial purposes. In point of fact, it is a strangely capricious metal. Few strong acids affect it, but soap and water rapidly corrode it; even hot water alone is not without influence upon it; therefore the applications of pure aluminium would appear to be necessarily limited to the end. But aluminium has a large range of combination with other metals. It forms alloys of various characters. At one time the belief was entertained that a sort of aluminium bronze—or in other words, a compound of aluminium and copper—might take the place of ordinary bronze for the manufacture of bells. Impressed with this idea, Mr. Denison tortured aluminium like a very alchemist, in order to see if, when united with copper in suitable proportions, sweet music might not be got out of it. He did not succeed; no sort of aluminium bronze was found adapted to the purposes of bell-making; but Mr. Denison, in common with all who had worked in the same direction, was much struck with a certain alloy of aluminium and copper, which to the eye had so much the appearance of burnished gold, that he ventured the opinion that the gold-like metal would ere long be used for the purpose of mock jewellery. Whether our neighbours over the water heard of the notion expressed by Mr. Denison we are unable to aver, but certain it is they commenced making false jewellery of the gold-like aluminium bronze very soon after the notion of the possibility of doing so was breathed in the lecture theatre of the Royal Institution. At the period of our writing a considerable amount of this mock jewellery is circulating over the world. Its colour is unexceptionable. The most knowing connoisseur might be deceived, judging from mere appearance, and might set it down as nineteen carats gold at least. The most easy way to discriminate between gold and the mock alloy is to notice the low specific gravity of the latter, being even less in this respect than ordinary gun or bell metal. Fortunately, or unfortunately, as the case may be, there is experienced great difficulty, or perhaps impossibility, in soldering the mock metal, or the substitution of it for real gold would be even more practised than now.

Almost as soon as aluminium bronze became known in England, a London gun manufacturer (Mr. Lancaster), struck with some remarkable properties it seemed to possess, patented it for specific purposes. A metal as hard as steel, which forges as well as iron, which is lighter than common gun metal, which is no less than three times the strength of the latter, and does not tarnish in the air, seemed to promise great things in the hands of a gunmaker. A specimen of it was sent to our own authorities with reference to its employment in the manufacture of artillery, but the proposal fell still-born; they did not take to the new metal. If our people were wrong in their judgment of aluminium bronze, they are in a fair way of being taught better by the French, as a very interesting report in the *Comptes Rendus* of the Academy of Science for April 14 will make evident. The communication is in the form of a letter from M. Christophe to M. Dumas:—

"We have employed (writes that gentleman) the bronze of aluminium to two uses, for which its qualities of hardness and tenacity seemed to be very promising. The success has been quite equal to our expectations. The first is the construction of bearing surfaces for rotating axles; the second for slide valves and other bearing surfaces exposed to much friction. Of these applications the following are examples:—The bearing surfaces, ordinarily called brasses, of the axle of a polishing wheel, making 2200 revolutions per minute, were made of aluminium bronze eighteen months ago; they have lasted to the present time. Other bearing surfaces under similar conditions do not last more than three months. Again, the slide plane of a mechanical saw, moving with the velocity of 240 revolutions per minute, was made of aluminium bronze. It has been used now one year without any apparent trace of wearing out. Slide planes of bronze would not, under similar circumstances, have lasted four months. The second application of the aluminium bronze is for the manufacture of fire-arms, large and small. One pistol barrel having been constructed of it in that gentleman's manufactory, it was tried in the practise ground of Renette, on which occasion it came triumphantly through the ordeal, and was subsequently forwarded to the exposition at Dijon. There arrived, it was subjected to the scrutiny of a jury, the members of which suggested many tests of its goodness, all of which the pistol barrel admirably withstood."

Commenting on this trial of the pistol barrel, M. Christophe, speaking on behalf of himself and partners, goes on to say:—

"We do not wish to conceal the obvious fact that a trial of a pistol barrel, however successful in result, can prove little in respect of the applicability of the metal to ordnance; but the comparative experiments made by us between this metal, bronze, iron, and steel have demonstrated the immense superiority which it presents over the others, a conviction of the firmest kind, so far as our individual opinions are concerned, and which we requested the Academy to represent to the Minister at War in support of our proposition, in order that there may be made, at our expense, such a piece of artillery as may be thought most proper for testing the qualities of aluminium bronze in the capacity of a gun-metal. We look for great results in this direction, which we shall feel proud to associate with our name."

It appears that accompanying the letters of M. Christophe were two bars of the aluminium bronze. One of these is forthwith to be forged and bored into the barrel of a Minnie rifle. The other, a smaller bar, has been tested, with a view of manifesting some of its prominent qualities. It was found to forge well at a cherry heat, and it works cold like steel of the best quality. Ordinary bronze is rendered quite brittle by heat, and cannot, therefore, be forged at all.

The most important part of our communication has now to be made. It is this:—In deference to the eulogiums of aluminium bronze conveyed by M. Christophe, his note is referred to a military commission, composed of Marshall Vaillant and MM. Piobert and Morin. We are in a fair way, therefore, to learn more about the gun-making qualities of aluminium bronze.

CORNISH MINING MAXIMS.—No. XIII.

"Out of the World, and down to St. Ives."

This well-known saying affords a most excellent practical demonstration of the folly of prejudice, particularly in mining matters. The ancient borough to which allusion is made was formerly out of the prescribed limits of mining influences. The few mines in the locality were treated as being, and virtually were, wrought for mere boroughmongering and electioneering purposes; the whole district was held to be literally out of the mining world (the "world" of the Cornish), and to be only worthy of consideration as a rotten pocket property, whose voters were venal enough to be purchased by any adventurer bidding the highest; and as a fishing village, of no worth but for pilchards and train oil. How often, however, does the rejected stone become the head of the corner. We hear now no more of "Out of the World, and down to St. Ives;" but, if you want tin go to St. Ives, the mines of which are among the most prominent in this branch of Cornwall's produce, and the district one of the most popular and attractive to speculators. Well-conducted and carefully-ma-

...ged properties have led to this great and interesting change. As long as they were under the influences of venal strangers the vast worth of these mines was hidden; but when liberated from the thraldom of party purposes, and the curse of prejudice, and were consigned to the speculative spirit of real miners, their industry, perseverance, and science soon established them as among the most excellent properties the county of Cornwall can boast, enriching her landowners by revenues a prince might envy, creating a happy, contented working population, and scattering all those blessings that are sure to follow in the train of successful mining adventure, in addition to the intrinsic value added to the common weal of the kingdom by the immense profits to the proprietary, and the impulse to commerce thereby created.

Such are the facts of the case; the inhabitants of St. Ives know and feel that the value of their mining property is of far greater consequence than the mere patronage of a few talkative, pretending patriots, who only visited and flattered them on the eve of an election, and too frequently left the players themselves to pay the pipers. They know, and feel too, that the bar of extradition is taken off, and that this once almost (in Cornwall) universal maxim is fast becoming obsolete.

In mining it teaches, or should teach, us not to condemn from hearsay, prejudice, or tradition; that under the benign influences of capital, science, and perseverance, many spots that have been and are lingering under the most unfortunate circumstances may, like the one referred to, become, if not the greatest, an integral portion of the community of which it is a member. Although the phrase has become obsolete, the memory of it should be cherished; to the adventurer and young miner it may remain in full force, and in the hour of need they should remember "Out of the world, and down to St. Ives."

GEORGE HENWOOD.

MINING IN AUSTRALIA.

The following are from Australian mining companies:—

BURRA.—A dividend of 5*l.* per share was declared on Feb. 15, being ... paid by this company, and is equivalent to a profit of 400*l.* per cent. per annum.

KAPUNDA.—March 18: The sinking of the Buhl shaft below the 50 was being steadily proceeded with. In driving west from Lanyon's shaft to cut the lodes in the 50, the same hard ground was met with that had impeded the previous eastwork operations in these workings, and a continuance of which would delay the working of those lodes for six weeks or two months longer, but the manager expresses a hope that they might be reached in a month, when the raise of ore would doubtless be considerably augmented. The tribute workings continued their average yield as to quantity, with an improvement in the quality of the ore. The January ores had proved to be 27 tons, of 21·329 per cent. average produce, equal to 5¾ tons pure copper; and the February ores, sampled on March 12, amounted to 252 tons, of an average produce exceeding 20 per cent. The make of fine copper during the months of January and February was below the average, the ores on which the smelters were engaged requiring more time and labour than usual in the various smelting processes. Those on which they were operating at the date of the recent advices were expected to give better and quicker returns. The delivery of fuel was increasing, and the price still remained as low as 7*s.* per ton. The shipment of 83¾ tons of copper per *Granton* for London consisted probably the direct shipments for the season by the wool ships. Future ones will be made *via* Melbourne, and freight has been arranged for the conveyance of the company's copper by that route at 30*s.* per ton to England, being a reduction of 10*s.* per ton on the freight paid last year.

NORTH RHINE COPPER MINING COMPANY OF SOUTH AUSTRALIA.—March 7: The local committee visited the property on Feb. 18, and inspected the workings at Wattle and Napoleon shafts, from both of which good ore continued to be raised. Nicholls' and Rodda's shafts were sunk to 14 fms. each. All the ore at grass over 25 per cent. was ordered to be at once carted to Port Adelaide without washing, and the lower quality ores to be dressed up to that percentage, in order to be shipped per *Verulam*, which vessel was expected to sail for England in March. The committee express their opinion that on the cutting of the Rodda and Nicholls' shafts the yield of ore will be much increased. Advertisements had been inserted in the local papers for tenders for the carting of ore from the mine to the port. Capt. Rodda reports, under date of March 7, that the 9 fm. level stopes are looking better; four men are now working there, breaking some good work. Wattle's shaft is sinking by four men, in the south end of which there is good ore. I have taken two men from Napoleon's shaft to open on a branch of ore near Nicholls' shaft. All the hands that can be obtained are now washing and dressing ore, and if you could engage six more practical miners I could open up a good deal of favourable ground. I expect to break a great deal of ore next week. In continuation, the captain remarks that the oxide of iron, which exists there in large quantities, contains gold. The ore holds a good deal of jacotinga (a substance always connected with gold), which is the oxide of iron; and taking into consideration that the iron in the mine is disposed to hold gold, there may be a large quantity found.

BON ACCORD.—Feb. 16 to March 16: The second boiler added to the small engine at the mine enabled it to do increased work with much less fuel. The works, therefore, continued to be proceeded with, and there seems to be no doubt that by next mail the board will be advised of the purchase of one of two large engines in the offer of the committee. The following is an extract from Capt. Jeffrey's reports:—"The engine was put to work (with second boiler, but only one lift of pumps) on Monday evening, Feb. 21, and we forked the water on Thursday, at 2 o'clock P.M. I have set the 30 fm. level to drive west of engine-shaft by six men; I have only set 2 fms., at 16*l.* per fm., as the ground at present is hard, and very wet, which makes it "speary" for driving, but I hope we shall have a change for the better shortly. The ground is (on March 8) much softer for driving. I think it advisable to suspend driving this level until we get the second lift of pumps down, which we are preparing to do next week, as the water is increasing very fast. The engine is not burning any coals at present. I do not think there will be any difficulty in getting firewood at from 16*s.* to 17*s.* per ton. I set yesterday to sink 2 fms. in the winze shaft by four men, at 9*l.* per fm.; the lode is harder, with spar, iron, and good stones of ore. Sunk this week 2 ft. 3 in., making a total sunk from 12 fm. level of 7 fms. 9 in., towards the depth of 30 fathoms aimed at, where to meet the level driving west from the then present bottom of the engine-shaft. We set the engine to work last evening (March 11), and with an additional lifts of pumps, and it forked the water down within 2 ft. of the bottom of the 30 by 10 o'clock this morning; so I am quite satisfied we shall be able to keep the water under, and after we cut the lode in the 30 west I would recommend to drive east of the engine-shaft to cut Elder's lode. The following is an extract from the letter of the Chairman of the committee:—"As soon as we can ascertain the probable expense of carriage we shall be enabled to come to a decision, and there is little doubt but that by next mail you will be advised of the purchase of one of these engines, as the choice lays between the two. The additional boiler is of great assistance, and enables the engine to do additional work at a much reduced consumption of fuel. I am still hopeful that we may lay bare a good lode of ore before it is overpowered. We hope to be able to use wood exclusively."

WORTHING.—Capt. Remtry, March 14: The engine-shaft has been sunk during the month 3 fms. 2 ft. 9 in.: total depth from surface, 13 fms. 4 ft. 6 in., where there was a good course of black and yellow ore. There were four men stoping the bottom of the 10 north and south of Hocking's shaft, where they have a good lode. Two men sinking about 10 fms. south of old whim-shaft, ground favourable, and lode very promising, yielding rich carbonate of copper. The ore raised during the month was computed at 14 tons 6 cwts.; average produce of about 15. The smelting works had done well. There were (in addition to the 85 tons of copper ore already shipped) about 20 tons of high quality regulus, and 2 tons of coarse copper, worth (say) 95 per cent.

WHEAL SARAH.—A portion of the specimens from here has been assayed by Mr. Hampton, of the English and Australian Copper Company's works, and exhibits, according to that gentleman's certificate, 63¾ per cent. of pure copper. This ore was taken from the eastern end of the 10, and the captain of the mine expresses his full belief that when the men who are at present engaged driving an end to the shaft shall have cut the lode through the ore will turn out to be even richer still. There are at present about 14 miners employed on the works, and Capt. John Roach (a relative, we believe, of Captain Roach of the Burra) has been recently appointed resident agent at the mine, so that now the shareholders may rest perfectly satisfied with the future working and result of this valuable establishment. Several tons of the ore are at present lying at the English and Australian Copper Company's works for smelting, after which process it will be shipped to England. This mine, better known as Mr. Bath's mine, is now subdivided into 10,000 shares.

CRINNIS COPPER MINE.—The first call upon the shares was paid up in February, 1858. Shortly afterwards the ground was broken for the purpose of sinking a shaft, which has now reached a depth of 23 fathoms. At a depth of 13 fms. a lode was struck, from which a specimen of ore has just been brought to town. The company were not in possession of a steam-engine for some three months subsequent to the commencement of their mining operations, so that it is evident they have pushed the works with vigour and enterprise. The influx of water up to the present time has been very great, but the engine, at the level now attained, successfully resists the encroachments of this element without being worked above one-half its available power. The practical conductor of the enterprise entertains no doubt that the engine will continue to lift the water and draw the ore efficiently down to a depth of 45 to 50 fms. Before this is accomplished it is believed that some relief will be obtained by the progress of a cross-cut now being made from the present level, which it is further anticipated will touch a lode of unusual size and satisfactory richness. The specimen already referred to as having been extracted at, or rather a little below, the 13, and brought to town, now lies at the Terminus Hotel, North Terrace. It is of grey copper, weighs 136 lbs., and it is estimated to contain from 45 to 50 per cent. of copper. The conductor of the mine expresses a confident belief that the lode in which it was found will prove to be connected with a shoot or branch of ore, likely to be of great depth.

APPEALINA COPPER MINE.—The shares in this mine had been sold in Adelaide at 600 per cent. premium.

ENGLISH AND AUSTRALIAN.—March 14 and 18: Two of the furnaces were out, and cannot be repaired until the fires of the other furnaces go out for stock-taking. The manager states, however, that more copper would be made this year than in the past. "Our present stock of fuel I may say insures this, barring some extraordinary accident. Cartage power has continued pretty brisk during the last four weeks, and we hope it may keep on so while the good weather lasts." The shipments of ore had been about 1000 tons, and possibly might reach 1800 tons before the traffic from the works to the shipping port closed for the season. There were about 500 tons of coals at the Gawler station, which would be conveyed to the works before the rains set in, and possibly a portion of nearly 2000 tons on the wharf at Port Adelaide. There were on March 5 about 1000 tons at the works.

PORT PHILLIP AND COLONIAL GOLD.—Melbourne, March 15: The operations at Clunes had progressed much better than during the previous month. The quantity of quartz crushed during February amounted to 997 tons, and the receipts were 2893*l.* 13*s.* 4*d.*; expenditure, 1832*l.* 10*s.* 10*d.*, showing a profit of 971*l.* 2*s.* 6*d.* The month of March will probably show a still greater improvement, as during the first fortnight 887 tons of quartz were crushed. The resident director does not forward any remittance by this mail, thinking it better to await the arrival of the mail with the instructions of the board after the January meeting. The Clunes Company still found some difficulty in keeping the machinery fully supplied with quartz of good quality, and they were then trying other portions of the reefs, trusting that the same would improve. A great difficulty was also experienced in the want of water, consequent on several miners erecting puddling-machines on the banks of the creek, above the works; this was about being remedied by sinking wells, and driving into the drift for the present, and in erecting a dam in conjunction with three other quartz-crushing companies for the summer use. The bill for regulating mining on private property had been abandoned for the present, and one good had resulted from its introduction and discussion—that there would be no opposition to its future passing.

DISCOVERY OF RICH DEPOSITS OF COPPER IN AUSTRALIA.—The subject to which I am desirous to direct attention is the discovery of a rich deposit of copper ores. Most of your colonial readers know of the mountainous group named the Canobias, situate about 160 miles westward from Sydney, and 40 miles from the town of Bathurst. The deposit is in a deep ravine, on the south side of these mountains, and appears to be a lode about one chain wide, composed almost wholly of red and black oxide, native copper, and copper and iron pyrites, and, without any exaggeration, it is one of the most magnificent deposits of copper ores ever found in any age or country. I know most of the richest mines in Cornwall and Devon; I have also seen the celebrated Parys Mine, in Anglesea, and am persuaded this will rank second to none of them, indeed it is equal, if not superior, to the Burra Burra itself. To give some idea of its extraordinary richness, I would mention that out of a moderate sized pit about 250 tons of ore have been dug, that will produce from 30 to 35 per cent. of copper, the value of which may be estimated at from 7000*l.* to 8000*l.* This is no puff, having myself no interest whatever in the concern, further than an anxious desire to see the resources of the colony developed. The mine is on land purchased by three or four far-seeing parties some years ago, and is worked by some persons on tribute, at three-quarters the produce, or in mining phraseology at 15*s.* in 1*l.* The proprietors did not seem aware of the value of their concern, or they have been extremely modest, or as yet, even in the vicinity of the mine, there is little talk about it. The works are named after the mountain, and called the "Canobias Mine."—J. B. CLYNO, mine agent, Guyong, near Bathurst, March 7.

The above is from the *Sydney Morning Herald*, a paper published at Bathurst, which also says:—"Considerable excitement has been produced by the announcement that the Canobias Copper Mine, which, it will be in the recollection of our readers, has already attracted considerable notice under the auspices of Messrs. Rodd and Samuel, has proved highly remunerative to the labourers who are employed upon it, working on a system of tribute. It appears that a lode has been discovered, composed of the richest red oxide, with portions of malleable or native copper and some sulphurate. In fact, nature has been most lavish in the formation of this most extraordinary deposit, and it has been visited by many persons who are practical men, and have visited some of the richest mines in various parts of the world, and they have pronounced most favourably upon its probable results. The lode is about 70 ft. wide, crossing one of the deep gullies on the southern side of the Canobias Mountain. As yet very few persons are employed upon it, but they, in sinking a mere pit, have raised about 250 tons of ore, which apparently will produce at least from 30 to 40 per cent. of copper, valued at from 7*o*0*l.* to 8000*l.* The accuracy of this statement may be relied upon, and little doubt can exist that so remarkable a discovery will exert a most important influence on the interests of this district, affording as it does one more potent argument in favour of a railway between this town and the metropolis. We have already inspected a specimen of the virgin copper from this mine, which completely bears out the report we have given above, and we hope to have a sample which will lie in our office during the coming week for public inspection.

A GOLDEN VISION FROM AUSTRALASIA.

TO THE EDITOR OF THE MINING JOURNAL.

SIR,—During my sojourn on the Indigo Diggings, and crossing the Ranges from the Black Boy Creek to my tent on the Indigo Main Lead, on the 1st Feb., I picked up part of a copy of the *Melbourne Herald*, which on perusal I found contained a transcript of a letter from your Journal of Sept. 15, 1858, communicated by Mr. Evan Hopkins, containing statements and reflections not at all in accordance with fact. * * *

In one part of his letter he asserts not only that the gold deposits of Australia are strictly comparable to those of South America, and to other places, but that Victoria is not, nor likely to be, a mining country, simply because there are no minerals. Now, the deposits of platina at Forest Creek, and other places in the alluvial sinkings—the lodes of native alloy of gold and bismuth at Tarrangower (see Mr. Birkmyre's testimony), Indigo, and elsewhere—large lodes of native alloy of gold and antimony at MacIvor, the Ovens, &c.—which with manganese, uranium, tin, titanium, and hematites, open up to the ken a fine field for capital and industry, so soon as the present mal-administrators shall have been forever displaced by honest men and more liberal-minded statesmen. In Victoria, at least, not only are the quartz reefs richer in depth, but when the true theory of their formation is known, and the nature of gold deposits better understood than accords with the past and present notions and doctrines of geologists, it will be seen that these secondary, tertiary, and quaternary formations must be richer below than above, and a means will be descried whereby men may hypothetically discover in what districts lie the richest gold fields, and why heavy gold is found in one place and grain gold in another.

On another occasion, when I shall have more time, I will give you a new system of Auriferous Geology for Australia, that may or may not be applicable to the South American, Hungarian, and the Uralian gold fields, and merely premise that the gold deposits of Victoria and New South Wales are of three different kinds, and each kind of deposit of many different epochs, ranging from the scope of humanity back into the remote past of planetary existence, by entire cycles of not less than 25,000 years each, being able to show, by a section of strata in a shaft of 92 ft. on the Indigo, sunk by myself last month, the positive evidence that not less than 55,000 years have elapsed since the ancient river's bed, forming the locus of the "Lead" at the Indigo was in natural use as a fluidatile stream, and that a still further remoteness in the past has obtained since the quartziferous strata whence the gold "cradled" by this ancient river in subsequent times were deposited under the waters of the *hoary old ocean* by some more ancient *streams*.

To give the contradiction direct to the assertion of your correspondent, that I "went to New South Wales to carry out my views of new processes," I shall now, as a sequel to this letter, state the nature of my errand to Australia, and what success I have had therein. My errand here was twofold—Firstly, to acquire the money and opportunity to explore for myself a district discovered in 1852 by two acquaintances of mine, who emigrated from London in 1850, the account of which was sent to me in London in 1852, and again repeated in 1853. These letters described the route of a journey from Mount Alexander to some place in New South Wales, where, in a very inaccessible locality, the ground was literally *flagged* with gold, in masses too heavy to carry to any considerable distance, and smaller pieces brought away by them of the aggregate weight of about 19 lbs. avoirdupois; and near the same spot, on the side of a pool, an isolated mass of gold, containing *from 12 to 14 cubic ft. of metal*, whose weight was described as *not less than 6 to 7 tons!*

Not liking to leave these treasures to the facile gaze of other ramblers, they employed themselves three days in throwing the former into a neighbouring river; and undermining the large mass on the side of a pool, they succeeded in rolling the latter into deep water, presuming that with little more than the same outlay than the mere transport of the whole to the nearest port would require ere anything could be done to secure these treasures, the whole could be raised with certainty and ease from their artificial watery depôt. These letters startled me, and I could not understand why Sydney or Melbourne could not be made available for the necessary constructions and outlay to re-possess and bring away this deposit of wealth. My correspondents' only explanations were, that in consequence of the almost insuperable difficulties of access to the locality in question, nothing could be done without a small steam-boat and the usual accompaniments, inclusive of a diving apparatus; but that such was the nature of the Melbourne and Sydney society, composed principally of "Vandemonians," "Old Hands," &c., whom it was not policy to trust with the secret; and to have been seen going backwards and forwards individually would have created a *rush* of thousands of diggers to the spot, the consequences of which on so small and confined a locality would have been fearful. So they preferred to entrust me with the secret, and the commission to form a limited association in London, with a capital of about 3500*l.*, to effectuate the whole purpose. One of the two discoverers died of fever at Canvass Town in 1853, and I find the subsequent silence of the then survivor accounted for, on my arrival in Melbourne in Feb., 1858, by his accidental death by a stray bullet at the Ballarat riots in the August of 1854. * * * *

I arrived in Melbourne on Feb. 14, 1858, with very limited means at command, and obeyed the usual call of a "rush" to Heil's Hole Diggings, on the Devil's River, in the latter part of April, 1858, whence, after sleeping in the bush, without tent or covering save a pair of blankets, and sinking a hole or shaft 22 ft. deep, I returned—*i. e.*, walked back to Melbourne—about the middle of June, with 5 ozs. 4 dwts. of gold in my boot. During my stay at Heil's Hole I made the acquaintance of Charles Jackson, a M.A. of Yale College, a digger, with whom I went over the Millewa, betwixt Albury and Wahgunyah, to see a volcanic district described by him in New South Wales, in which I thought I saw a great resemblance to the locality described in my Australian correspondents' letters; and judge of my surprise to find myself on one of the two veritable spots in the most vicarious and accidental manner, not by the circuitous route adopted by them in 1851-2, but directly on to the mountain spur, whose precipitous face almost precludes access, and whose promontory constitutes a small volcanic crater, very shelving interiorly, with a pool of water therein, and beset by swamps in summer and lagoons in the winter, for miles in extent. After a little general inspection, such as to find the water in general looking blue by reflection, except near the mountain shore of the pool, which had a bright yellow cast, and to remark the general basaltic character of the district, and its perfect similarity to Ballarat, where all the large masses of gold have hitherto been obtained, I left the place by the way I came upon it, in company with my acquaintance, but without once alluding to the nature of my discovery.

Having come to the Indigo Rush the latter end of last November, where I am *slowly* acquiring the funds required, and finding myself within a few miles of Wahgunyah, I paid the locality I visited with Jackson another visit, a month ago, without attendance, except a fierce dog, a bowie knife, and a revolver; and, after a stay of several days, succeeded (the water being low) in getting *an actual sight of the great nugget in its watery bed*. My head swam with dizziness, and I felt sick, although the sun was not hot, and with some difficulty made my way between two lagoons to the bank of a river, about a fourth of a mile distant, and there saw the other pools having a yellow cast, and containing, I have no doubt, the residue of the *original "Find,"* probably as estimated by them at TEN TO TWELVE MILLIONS STERLING! The whole district appears to have been the subject of volcanic upheaval and subsequent denudation, which developed the site of deposit of these aural masses amongst a profusion of boulders of basalt, imbedded in ferruginous clays and ochres. The Great Welcome nugget was found below three separate deposits of basalt, separated by clays and marls, and amongst an assemblage of these same basaltic boulders, which being piled one upon another like vertebræ, as in the Plenty River district, look like columns. Now, as it is just possible some of your readers may entertain a desire to prosecute the acquisition of this treasure, I hereby offer the chance to them.

* * * * * * *

trust no person will take up this speculation in distrust of my veracity as to the existence of the treasure, or my true impression of the impossibility of realising it by any other method than the one I have proposed, as I have no interest nor object in the prolation of falsehood nor chance of self-delusion. I know people are apt to be startled by any account that professes the discovery of gold by the ton instead of by the ounce, but when it is considered that heavy lumps have been found at MacIvor, Ballarat, Fryer's Creek, Forest Creek, Bathurst, &c., &c., all volcanic districts, as attested by the abundance of basalt that is found on the surface and to the depth of 150 ft. in some places above named, out of whose streams have percolated the masses of molten gold when the momentum forward become less than the gravity of the metal,—even so of those masses on the surface constituting the discovery in question; the whole country for miles around is likewise basaltic, and many "Fumerolls" in the neighbourhood evidence not only where the golden masses have come from, but also that in their contiguity it would be reasonable to "prospect" for such *"heavy finds."* Where neither quartz veins nor their sandstone and schistoze accompaniments are found, there alluvial gold is seldom found: and, on the contrary, heavy masses of gold, although occasionally found in quartzose regions, are most often found underlying masses of basalt in pentagonal and hexagonal pieces, fitting upon one another like vertebræ, and commonly called by the ignorant miner "boulders of blue stone."

I find *here* no traces of volcanic action, nor effect of subterranean fires in the auriferous deposits, save these basaltic masses, with the presence of ashes, &c., in the locality to which my attention is now particularly directed, and the substances denominated by the miners "burnt quartz," and "cement," are entirely of aqueous formation; and one little fact attests the marine formation of the whole country—the presence of sea salts in all waters collected in excavated ground to the depth of 250 feet.

Indigo, Victoria, March 1. WM. RADLEY, Ch.E.

At the Bon Accord Copper Mining Company's second annual meeting, to be held on Monday, the statement of accounts from the commencement of the company to December 31, 1858, in the colony of South Australia, and in London to March 31 last, will show—Receipts and liabilities in London, 38,467*l.* 0*s.* 3*d.*; ditto in Australia, 659*l.* 5*s.* 9*d.* = 39,126*l.* 6*s.*—Payments and assets in England, 32,405*l.* 6*s.* 3*d.*; ditto in Australia, 6720*l.* 19*s.* 9*d.* = 39,126*l.* 6*s.* Out of the 39,126*l.* 6*s.* received on the company's account there has been paid for the Bon Accord property 24,000*l.*; for other adjoining land, 339*l.* 15*s.*; there was cash in hand in Australia, on Dec. 31 last, 96*l.* 1*s.* 11*d.*; and cash at bankers', &c., in England, on March 31 last, 3626*l.* 16*s.* = 28,052*l.* 12*s.* 11*d.*: leaving a balance of 11,063*l.* 13*s.* 1*d.*, which had been expended in preliminary expenses, steam-engine, machinery, freight, fuel, labour and mining operations, tools, &c. The committee succeeded in making a satisfactory arrangement with Messrs. Jeffry and Killicoat, two well-known mining captains in the colony, who had offered, on certain conditions, to point out the part of the Bon Accord property where operations ought to be commenced, and where ore would be found, and to direct and conduct the works at the mine. Mr. Jeffry, having left the service of the Burra Burra Mine, became the mining captain of this company, under an agreement, at a salary of 20*l.* per calender month. A further agreement was entered into with Messrs. Jeffrey and Killicoat to the effect that, in the event of their information and practical directions leading directly to the discovery of a remunerative copper mine in the Bon Accord property, within a year and nine months from their commencing operations thereon, but not otherwise, the company shall pay to them 1000*l.* out of the first nett profits derived from operations conducted by them, when the balance sheet shall show a nett profit of not less than 10,000*l.*, taking into account all ores then at grass, and that the company shall also deliver and assign to them, free of charge, 500 shares in the capital stock of the company, with 10*s.* per share paid up thereon. On March 8, 1858, operations were commenced, without the aid of machinery, by 18 miners and the necessary mechanics, under the direction and superintendence of Capt. Jeffray. The mining captains having pointed out to the committee the walls of the lode in Beck's workings, in the Burra Burra Mine, and traced what they considered to be the course of the lode, along the surface, through the Bon Accord property, it was determined to open ground by sinking Jeffrey's shaft and Grainger's shaft, and by clearing out an old surface pit, since known as Killicoat's shaft or workings, and driving a level westward therefrom at the depth of several fathoms, the object being to examine the ground below the surface, to determine the spot where to erect the steam-engine and sink the engine-shaft. While these works and other additional operations were being proceeded with a steam-engine was procured and forwarded to the colony, which arrived safely at Adelaide at the end of July. Its erection was completed on Oct. 19, and it commenced working on Nov. 9. Shortly after operations were commenced it was deemed desirable that some sections of Government land close to the Bon Accord property should be acquired in order to provide paddocks for the carters' cattle, and to give depasturing rights to parties taking allotments in the township of Aberdeen. After some delay a purchase was effected of 336 acres, at 1*l.* per acre, of the nearest unsold land to the Bon Accord. After a careful and extensive examination of the ground at various points, Capt. Jeffrey formed a decided opinion that there were three places in particular where the indications of the existence of ore in body were marked and encouraging—in Elder's shaft; in a level driving east at the depth of 21 fms. from that shaft; at a point where the level will cut the lode, known in the Burra Burra as Finline's lode, in its course northwards through the Bon Accord property; and in a level driving west at the depth of 30 fms. from engine-shaft, and at a distance of from 16 to 20 fms. from that shaft. In these three directions, therefore, in conjunction with the important work of carrying down engine-shaft, operations have for some time been chiefly carried on. The steam-engine completely answered its purpose for some time. But after the shaft had been sunk 31 fathoms, and a large amount of necessary work accomplished by its action, the increase of water in the workings at the end of January last was so great as to overpower it. As it became doubtful that much farther progress could be made without the aid of a larger and more powerful engine, the committee forthwith took the necessary steps to ascertain whether such an engine as might be required could be found in the colony. From the last advices there is reason to believe that a powerful 50-in. cylinder engine has been secured on the spot, at a much less cost than it could have been provided and sent out from this country. The drafts of the committee, which were advised by the mail that arrived last month, will exhaust the funds shown to have been in hand on March 31, and as further drafts to a considerable amount may be expected in order to pay for the large engine that has no doubt been purchased, and to carry on the works with vigour and effect, the directors felt it necessary to make a call of 5*s.* per share, payable on the 20th inst. The directors believe that the mine has been well opened, and the works so far prudently and judiciously managed, and continue to entertain the same favourable opinion of the undertaking as when the company was first formed. The directors who retire are Messrs. W. H. Dickson and A. L. Elder, who, being eligible, offer themselves for re-election. Mr. G. Herring is the auditor who retires. In an appendix to the report it is stated that the average number of men employed in Elder's shaft, was 5, whose average weekly earnings was 47*s.* 2*d.*; in the 21, 5, earnings, 44*s.*; in Dickson's shaft, 6, earnings 48*s.*; and in engine-shaft, 9, earnings 24*s.* 2*d.* The total number of hands employed in January was 21.

TEMPERATURE OF THE EARTH AT DIFFERENT DEPTHS.—In an interesting lecture at the Royal Institution, Mr. Hopkins noticed at some length the observations which have been made in different parts of Europe, from which it appears that the temperature increases 1 deg. Fahrenheit's thermometer every additional 60 ft. that it approaches nearer the centre of the earth; and he alluded particularly to observations made in sinking a shaft at Monkwearmouth to the depth of 2200 ft., and of a still deeper shaft at Dukinfield, near Manchester. Assuming that the temperature continues to increase at the same ratio, geologists have concluded that at a depth of about 70 or 80 miles the heat would be equal to 6000 deg., at which the hardest rocks would be melted. The object of Mr. Hopkins was to show that such conclusions are erroneous. In the first place, they are founded on the assumption that the lower rocks possess the same power of conducting heat as the sedimentary deposits on which the observations have been made; but, supposing their conducting power to be greater, then the increase of temperature in descending would be in a slower ratio, always supposing that the source of heat was the central portion of the globe. He illustrated this position by comparing the transmission of heat through a thick mass of metal and through a plank of wood, both being exposed to the same temperature. In the former case, owing to the greater rapidity with which the heat is conducted, the external surface, though more removed from the heating source, would be only of the same temperature as the outer surface of the thin plank of wood; and in penetrating through it deeper spaces must be traversed to arrive at equal temperatures. Mr. Hopkins has undertaken a series of experiments to ascertain whether the primary crystalline rocks do not, in fact, conduct heat more rapidly than the chalk, which he took as representing the conducting property of sedimentary deposits in general. The result of upwards of 100 experiments was, that the crystalline rocks are much better conductors of heat, and Mr. Hopkins said he was persuaded, from those experiments, that the conducting power of the lower rocks exceeds four or five times that of the upper deposits. He came to the conclusion, therefore, that the depth at which all bodies became fluid by heat must be 300 or 400 miles, instead of 70 or 80 miles. The same conclusion could also be arrived at astronomically, by the precession of the equinoxes. The periods of the changes of the position of the earth's axis, which occasion the precession of the equinoxes, has been calculated with great care, and those calculations agree exactly with astronomical observations. But the calculations of the effect of the action of the moon's different attraction on the nearer and more distant parts of the earth, which produces that phenomenon, were made on the assumption that the earth is a solid body, and they would not be correct if the interior were fluid, with the exception of so thin a crust as geologists suppose. Assuming, however, the crust of the globe to be 300 or 400 miles thick the fluidity of the remaining portion of the interior would not disturb the calculations of the mathematicians; and the conclusions which they have arrived at would correspond with astronomical observations, and with physical experiments. Mr. Hopkins alluded, in conclusion, to objections which have been raised to his hypothesis, but he said he felt assured that all those objections could be satisfactorily answered.

BREAKWATERS, WAVE-SCREENS, &C.—A. H. Dendy, M.A., of Kentish Town (F. W. Campin, patent agent), has just specified his patent for "improvements in the construction of breakwaters, or wave-screens; applicable also in constructing bridges, roadways, piers, jetties, landing-stages, and other structures," which consist in constructing a breakwater, or wave-screen, &c., by laying down side by side, in the requisite position, a series of tubes of iron, or other metal or material, open at the ends, placed horizontally, or in a position approximating to horizontal, either with or without intervening spaces, with another series of tubes superimposed thereon, and so on until the breakwater, wave-screen, &c., is raised to the desired height, the transverse sections of which tubes to be of any shape and size desired, provided the length thereof be considerably greater than the transverse sectional areas, or waterways, of such tubes, so as to effectively break the force of the waves in passing through them (the tube used being open at both ends). The object being to construct a breakwater, &c., and place it in such a position that it shall present a very inconsiderable facial resistance to the direction of the waves, as compared with the mass of the structure, and shall at the same time counteract so far as may be requisite their undulatory motion and breaking force, by causing them to pass through long tubes or tunnels. These tubes may be fitted or fastened together by means of rings and bolts, rivets, chains, or other contrivances, or they may be built up in cement, or in any other approved material. And these tubes, or tunnels, may even be formed in brickwork, stonework, cement or other material; or the tubes may be formed by combining corrugated plates, or pieces of metal, or by any other method, so as to give the effect of open tubes, or tunnels. The breakwater being carried out in the water in the desired manner, and having a gangway, or roadway, at the top, will form a pier, jetty, or landing-stage, or the supporting piers of a bridge, by leaving sufficient waterway; or a roadway over marshy ground may be formed by these means; also the base of a lighthouse, &c.

IMPORTANT METALLURGICAL DISCOVERY.—Tungsten is a metal which has been hitherto little studied in a practical point of view. It appears, however, destined to operate a complete revolution in the manufacture of steel. It has been lately discovered that an alloy formed of 80 per cent. of steel and 20 per cent. of tungsten possesses a degree of hardness which has never been obtained in the manufacture of steel. This alloys works upon the latter with incredible facility, and can even cut it. Experiments have been made with this new composition at Vienna, at Dresden, and at Neustadt, Enetswalde, and considerable quantities of the alloy in question are, it is affirmed, being manufactured in that part of the world. Many old tin mines have been bought up with a view of extracting tungsten ore, and considerable prices have been paid for some that have not been worked for a long time.—*Photographic News.*

THE "ADAMANTINE CLINKER."—The resources of the county of Lincoln are being further developed at Little Bytham, by the Hon. Alberic Willoughby (son of Lord Willoughby d'Eresby), who is converting a valuable alluvial deposit, which exists there in abundance, into a small fine brick, which has already found considerable favour. The "adamantine clinker" is the name given by Mr. Willoughby to the brick. The clay of which it is made when dry is put into a mill, and being ground is at once ready for the machine, which cuts it into the shape and size required. The clinkers are then dried until ready for the kiln, and after being fired they exhibit a straw colour. Sir J. Trollope, Bart., and Mr. W. M. Brydone, chief engineer, Great Northern Railway, bear testimony to their excellent quality and great adaptability for paving stables, areas, and the like. We understand that these clinkers have also been laid down at the following places: The Duc d'Aumale's, Orleans House, Twickenham; the late Duke of Devonshire's, Chiswick; the Earl of Wilton's, Egerton Lodge, Melton Mowbray; Mr. R. Barbour's, Bolesworth, Cheshire, &c.; and are largely used by Messrs. Peto and Betts, Cubitt and Co., &c.—*Stamford Mercury.*

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London, April 28, 1859.

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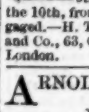

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